Customizing clusters: on the role of foreign MNCs in the formation of science & engineering clusters in emerging economies

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Abstract

Western multinational corporations (MNCs) increasingly locate advanced functions, including product development and engineering, in emerging economies, in order to gain access to a growing pool of science & engineering (S&E) talent and specialized service providers. Over time, new S&E clusters have developed in emerging economies which are strongly oriented towards global MNC demands. This study investigates the role of foreign MNCs in the formation of these S&E clusters. It is proposed that pioneer MNCs promote the initial development of S&E clusters by customizing local institutions and business practices, in accordance with their sourcing needs, and based on their experience in other local business contexts, including their home country. As a result, these clusters may develop specialized resources and service capabilities that particularly attract follower MNCs of the same national origin, who have similar sourcing needs. This study may inform both cluster formation research and policy-making in emerging economies.

Keywords:

Emerging economies, cluster formation, service capability, local institutions, offshoring, science & engineering talent

About the Author

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Customizing Clusters – On the Role of Foreign MNCs in the Formation of Science & Engineering Clusters in Emerging Economies

For many years, emerging economies have been important, low-cost, offshore locations for Western multinational corporations (MNCs) (Gereffi, 2005; United Nations Conference on Trade and Development, 2005). More recently, a new trend has emerged. Whereas in the past MNCs would typically relocate only labor-intensive, standardized manufacturing processes to less-developed economies (Gereffi, 2005), they now offshore more advanced functions, including software and product development (Manning, Massini, & Lewin, 2008; Patibandla & Petersen, 2002). This trend is being reinforced by the emergence of new types of clusters, in particular in India, China, and Eastern Europe, which provide a growing pool of science and engineering (S&E) talent (Manning et al., 2008). Unlike typical clusters in advanced economies (see, e.g., Bresnahan, Gambardella, & Saxenian, 2001; Saxenian, 1994), these clusters are geared towards providing upstream services to MNCs, including software development, product design and engineering. MNCs are attracted to these clusters not only by the availability of S&E talent, but also by the presence of specialized third-party service providers who are serving MNCs worldwide (Lewin & Couto, 2007). One famous example is Bangalore with regard to its IT- and software-related talent and services (Bresnahan et al., 2001).

The characteristics and the emergence of these new S&E clusters have not been investigated in greater detail, partly because they are a fairly recent phenomenon (see also Manning et al., 2008). Previous research suggests, however, that MNCs are likely to play a key role in the formation of these clusters (Barnes & Morris, 2004; Enright, 2000; Hoskisson, Eden, Lau, & Wright, 2000; Manning, Sydow, & Windeler, 2007). MNCs do not just stimulate cluster formation by investing in a particular location and by attracting new investors (Porter, 2000);

they also actively shape local institutions and practices so that they leverage on their local investments. This article investigates in more detail the role of MNCs in the formation of S&E clusters. It looks at how MNCs change local business contexts as a strategic response to institutional constraints (Oliver, 1991) and how they, more or less intentionally, help local institutions and service providers develop particular "service capabilities", i.e. capabilities they need to provide resources and services to foreign MNCs. Structuration theory (Giddens, 1984) serves as a "sensitizing device" in developing a better theoretical understanding of the dynamic interplay and mutual influence between MNC strategy and cluster formation.

Findings of this study may inform future cluster research and policy making. For future research, a better understanding of the specific features of S&E clusters and their emergence can be very useful. For policy makers in emerging economies, it may be crucial to learn how to best involve MNCs in local economic development in general and cluster formation in particular. In this regard, the findings also have important implications for policies targeted at sustainable cluster development. One key argument in this article is that strong orientation towards foreign MNCs and sustainability may not contradict each other if local institutions and service providers develop competitive service capabilities over time.

Cluster Formation and the Role of MNCs

Clusters are generally understood as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate" (Porter, 2000, p. 15). This often cited definition of clusters applies well to clusters in advanced economies, such as Silicon Valley (Saxenian, 1994), and certainly

also to new clusters arising in emerging economies (Bresnahan et al., 2001; Manning et al., 2008). The latter, however, feature particular properties that make them distinct from Western clusters. These properties have not been clearly identified in the literature yet. The new IT clusters in India, for example, have emerged in conjunction with increasing demand by Western MNCs for IT and software skills and expertise outside their home country. In fact, the Indian government promoted the development of software clusters in the 1980s as a way to attract technology-oriented foreign direct investment (FDI) (Patibandla & Petersen, 2002; Manning et al., 2008). Today, MNCs are attracted to Indian locations by the availability of specialized skills and service providers, such as Wipro and Infosys, as well as local universities that produce S&E talent for MNCs and service providers rather than for the domestic economy.

I will call these new types of clusters *S&E clusters*, where S&E stands for software, mechanical and other types of engineering, design, research & development. These clusters are emerging not only in India, but also in China and Eastern Europe in particular. Their main characteristics include availability of S&E talent and service providers hired by MNCs for S&E services, fairly high interdependence between local companies and globally operating MNCs (see also Enright, 2000), and presence of local institutions that support MNC investments and that often attract MNCs from particular Western economies.

One main feature of these new S&E clusters is that they typically attract companies *across* industries (Manning et al., 2008) – unlike Western industry clusters such as Silicon Valley. This is because they specialize in providing S&E services (e.g. software programming, research & development, and engineering), that are not specific to the industries MNCs are in but rather to particular sourcing demands. Therefore, the MNC's decision to offshore to a particular location is less related to the industry the MNC belongs to, but to the function the MNC intends

to offshore (Manning et al., 2008). Many third-party service providers have accordingly specialized in offering particular S&E-related services (e.g. software development), rather than in serving particular industries. Their profitability is in fact to a large extent based on economies of scale they generate from serving companies *across* industries. Also, S&E clusters are geared towards global rather than local demands. Their concentration in certain locations, however, results from agglomeration and specialization effects (e.g., Porter, 2000).

Furthermore, several studies (e.g., Deloitte, 2004; Lewin & Couto, 2007) suggest that S&E clusters often specialize in serving MNCs from *particular* Western economies. For example, German companies often select near-shore locations in Eastern Europe, rather than in China and India. Similarly, Spanish companies prefer locations in Latin America because of their cultural proximity. Over time, certain offshore locations become satellites of particular Western economies (see also Barnes and Morris, 2004). The attractiveness of offshore locations therefore does not only relate to the availability of talent and expertise, but also to the cultural and geographical proximity to the MNCs' home countries. In addition to that, offshore locations may develop certain institutional conditions that favour foreign direct investments from particular MNCs. For example, the ways in which MNCs make use of local institutions, such as universities, often mirrors business practices at home and at other offshore locations these MNCs have invested in. To understand this very feature of S&E clusters in emerging economies, their very formation and the role of MNCs therein must be investigated in more detail. This article takes initial steps in this direction.

With regard to the formation of clusters in general, it is useful to distinguish initial formation processes from subsequent cluster development (Bresnahan et al., 2001). For example, whereas agglomeration effects become very important at later stages of cluster formation, at an

early stage, cluster formation is very much driven by entrepreneurs (Bresnahan et al., 2001; Feldman, Francis, & Bercovitz, 2005). In S&E clusters, as I will demonstrate, MNCs rather than local companies often take entrepreneurial roles. In this regard, two aspects of entrepreneurship need to be distinguished. On the one hand, MNCs seek market or sourcing opportunities by investing in particular locations. That is, they act as "market entrepreneurs" in the sense of Schumpeter (1911) or Kirzner (1973). Most cluster studies have focused on this aspect of entrepreneurship (e.g., Feldman et al., 2005). On the other hand, MNCs may also have an interest in changing the local institutional context in response to environmental constraints (Oliver, 1991). In other words, they may act as "institutional entrepreneurs" (DiMaggio, 1988; Dorado, 2005). Importantly, as institutional entrepreneurs MNCs do more than just engage in "political management" (Brewer, 1992; Dahan, Doh, & Guay, 2006; Oliver & Holzinger, 2008). Rather, they may change, more or less intentionally, the very rules and practices of doing business and of involving local institutions in a particular local context.

To study how MNCs may change the local business context in general, and local institutions and business practices in particular, a structuration perspective can be useful. Structuration theory (Giddens, 1984) focuses on the interplay between agency and structure. It conceives structure as sets of symbolic and normative rules, and allocative and authoritative resources, which get enacted, reproduced, and transformed by individual and collective actors. These are regarded as potentially powerful and knowledgeable agents who apply rules and resources in interaction, and, in doing so, affect the continuous flow of events. They monitor the impact of their own and others' behavior while they (co-) produce, more or less intentionally, the very structural conditions under which they act. For its dynamic conceptualization of agency and structure, structuration theory has been used repeatedly in organization and network research

(Barley & Tolbert, 1997; Kilduff, Tsai, & Hanke, 2006; Sydow & Windeler, 1998; Whittington, 1992) and, more recently, in cluster studies (Lerch, Sydow, Huxham, & Hibbert, 2007; Sydow, Lerch, Huxham, & Hibbert, 2007). In what follows, structuration theory will be used as a "sensitizing device" (Giddens, 1984) to better understand the role of MNCs in the formation of S&E clusters.

The Formation of S&E Clusters in Emerging Economies

Based on structuration theory and empirical examples, two general episodes in the formation of S&E clusters in emerging economies will be distinguished in conjunction with different roles MNCs take in the formation process (see Figure 1): (1) the initial transformation of local practices and institutions, and the role of pioneers; and (2) the reproduction and differentiation of local practices and institutions, and the role of followers. These episodes should be understood as overlapping rather than as distinct. This is because, over time, certain local practices and institutions in S&E clusters may change fundamentally, while others – at least over some time – remain relatively stable. Also, clusters may experience transformational changes *after* more stable, reproductive periods, as well as times of decline and renewal after times of prosperity and growth. Although these aspects of cluster development are also important, they cannot be dealt with within the scope of this study. Rather, I focus on the initial and subsequent formation of S&E clusters as they grow into attractive locations for FDI.

Insert Figure 1 here

Initial Transformation and the Role of Pioneers

Under what conditions locations can develop into clusters is a widely debated question. Most cluster initiatives taken by governments and local authorities fail (see also Porter, 2000). This might be partly because governments underestimate the importance of entrepreneurial firms in the initial development of clusters – a phenomenon which has been widely discussed in the literature (e.g., Bresnahan et al., 2001; Feldman et al., 2005; Porter, 2000; Wolfe & Gertler, 2004). In the context of emerging economies, in particular pioneer investors can take a crucial role in developing local structures and institutions that later attract other, often similar investors and that help turn a location into a hotspot for particular investments.

First I would like to discuss why it can be attractive – and challenging – for a foreign MNC to be a pioneer investor, in other words to be among the first to enter a location long before it shows typical cluster features as discussed above. In fact, for multiple reasons, most companies select established clusters or hotspot locations, such as Bangalore and Shanghai, for making offshore investments in emerging economies. This is because these locations not only provide access to a pool of talent with desired skill sets, but they typically also have technical infrastructures and institutions in place that support foreign direct investment. These include investment agencies, universities with specialized programs, round tables etc. On the other hand, hotspots are typically characterized by tough competition, wage inflation and high employee turnover which put investments at risk (Lewin and Couto, 2007; Manning et al., 2007). In order to avoid these unfavourable conditions, some companies prefer to be pioneers in second-tier or completely unexplored locations. In particular, they are attracted by the opportunity to access qualified, yet lower cost S&E talent before potential competitors can do. However, these

locations typically do not have specialized talent and expertise readily available for they lack experience and institutions in dealing with foreign MNCs.

For local authorities, pioneer investors can be important "lead customers" who not only serve to attract new investors by their very presence, but who can help develop local conditions that make foreign investments more feasible. This process will be illustrated in the following by the case of a pioneer German automotive supplier in a mid-sized city in Romania who has built up a local engineering facility and at the same time transformed the local university into a customized service provider (see Manning et al., 2007).

When selecting the location, this particular German MNC was attracted by the opportunity to tap into an unexplored talent pool at a near-shore location in the Northwestern part of Romania. The attractiveness of this region can be partly explained by German language capabilities and historical connections with German culture. These connections go back to medieval settlements of a German minority group, known as the "Transylvanian Saxons". This particular city even has a German gymnasium, and a German consulate, and is governed by a mayor representing the German ethnic minority.

Importantly, however, this city also had a technical university with engineering programs in place that could serve as a talent pool. However, the city did not have much experience with high-skilled FDI prior to the arrival of the German MNC. Like many other neighbouring cities, it used to mainly attract low-end garment manufacturing. Given the lack of local demand, the university would typically not produce S&E graduates for the local economy. Instead, graduates would go abroad or search for jobs in other regions. More importantly, the university's S&E programs were largely outdated and would not provide the type of skills and qualifications a high-tech MNC like the German automotive supplier needed. Quite paradoxically, while the

local university was an important potential location factor, it was far from being a valuable resource for foreign investors like the German MNC.

In face of such institutional constraints, MNCs may respond with different strategies (Oliver, 1991). For example, they may decide not to invest in or pull out of this location; they may set up internal training programs that compensate for the lack of external training; or they may try to change local conditions. The German MNC took the third strategy by investing in a longer-term collaboration with the local university. The idea behind this collaboration was to customize university programs to satisfy company-specific needs, while keeping internal training costs relatively low. As part of this collaboration, the company would set up laboratories, change curricula, provide internships and train local professors by sending them to partnering universities in Germany (see in detail Manning et al., 2007).

This model of collaboration between universities and industry, in particular in S&E-related fields, is very common in Germany and has given German companies a competitive advantage (Murmann, 2003). German companies, as part of their "diaspora" to different parts of the world, try to adapt and apply this model in a number of offshore locations, e.g. Shanghai (see below), and thereby establish "German" business conditions offshore (see also, Barnes & Morris, 2004). These attract followers, in particular German MNCs, that are used to collaborative arrangements similar to the ones established by pioneer investors. Not surprisingly, in the case described above, the German automotive supplier has been followed by other German engineering companies. Today, the local university has a number of customized programs in place and delivers engineering graduates to other investors – mainly from Germany, but also from other Western European countries.

Customizing the local university, however, is not the only strategy the German MNC engaged in. The MNC also established an informal roundtable among German MNCs to discuss matters of mutual interest, such as wage inflation and poaching. Creating this roundtable helped establish and adapt norms and practices of doing business and of securing the very business conditions that make the region attractive for foreign investors. In this case, in particular German companies have benefitted from this informal arrangement. However, such roundtables exist in other locations, and they are not necessarily a "German" phenomenon. In larger, established offshore locations, for example, they often take on a more formal character, and co-exist with smaller-scale informal circles. In this particular case, however, they helped attract other German MNCs, rather than MNCs from other European countries.

Importantly, all these efforts have been supported by the local administration – mainly for two reasons. On the one hand, MNC investments in local infrastructures and business conditions can help establish longer-term ties between the foreign investor and the location. This is because by transforming and customizing local institutions, in other words by acting as "institutional entrepreneurs" (DiMaggio, 1988), MNCs like the German automotive supplier can establish rules and practices by which they can use these institutions as valuable resources for their operational needs (Giddens, 1984; Teece et al., 1997). On the other hand, and maybe more importantly, local institutions (e.g., the local university in the case described above) can learn how to deal with and manage collaborations with foreign MNCs. In other words, they can develop a "service capability" (see also Athreye et al., 2005) that attracts followers and that makes the location less dependent on individual foreign investors, yet establishes particularly strong connections with investors with certain sourcing interests (e.g. engineering skills) and a common national background (e.g. German companies).

Reproduction and Differentiation and the Role of Followers

As pioneer investors successfully engage in local entrepreneurial activities, they attract followers with similar sourcing interests, who often come from the same Western economy. Unlike pioneers, followers face a different set of local conditions. Typically, they enter local contexts characterized by already established economic structures, and linkages between MNCs, local institutions and external vendors. Although they can make use of existing service capabilities, e.g. the opportunity to customize programs at local universities, they are typically not in the position to change local conditions dramatically. Instead, followers mainly help reproduce and differentiate local structures and practices, by establishing linkages and collaborations in both firm- and location-specific ways. Thereby, they adapt their internal operations to local context conditions (Kostova and Roth, 2002; Manning et al., 2007).

One example for a location which attracts followers who benefit from and thereby help reproduce and differentiate already existing economic and institutional structures is Shanghai, China. In particular over the last ten years, Shanghai has developed into a hotspot location for Western MNCs in different industries. Among others, auto manufacturers and other engineering companies have been attracted to Shanghai as a hub for the Asian market, and as a magnet for S&E talent. In order to serve established and incoming MNCs, in particular from Germany, some universities in Shanghai have set up customized courses and exchange programs similar to the model described above. For example, the TongJi University has a German language program that is designed not only to provide Chinese S&E students with German language capabilities but to get them in touch with German MNCs. The latter have an interest in hiring German-speaking

S&E talent and therefore sponsor particular programs and departments in order to promote their brands and to attract high-skilled talent.

Incoming MNCs are invited to make use of these sponsoring and other collaboration opportunities. As they do so, they apply and reproduce established practices of collaborating with local institutions in general, and universities in particular. That is, they use local universities as resources according to already established rules and practices (Giddens, 1984). However, they also help differentiate local service capabilities. For example, since sponsoring whole programs is becoming more difficult at Shanghai universities, incoming MNCs are now trying to establish new forms of collaboration that allow for greater flexibility and that reduce conflicts of interest. The increasing difficulty of securing access to S&E talent through university collaborations also leads newcomers to experiment with alternative recruitment strategies, e.g. using external recruitment agencies and headhunters.

To give another example, followers may adopt and thereby reproduce certain service delivery practices. Recent studies (e.g. Henley, 2006) suggest that over time local providers, e.g. in India, have developed a variety of collaborative capabilities in response to and in anticipation of MNC demands. They have learned, for example, that part of their attractiveness to incoming MNCs is their growing experience in recruiting and retaining S&E talent. Incoming MNCs who seek to avoid the challenge of managing talent may select external partners who specialize in providing skilled talent on a temporary basis. However, not all partnership models survive. In fact, newcomers also play an important role in rejecting collaborative practices. For example, concerns about managerial control or service quality may lead incoming MNCs to opt for captive rather than outsourced delivery models. Recent studies indicate that in particular German and Spanish companies have a preference for captive models (see Lewin & Couto, 2007). As more

incoming MNCs show a certain preference, this may force local service providers to respond by changing their business models over time.

In sum, by engaging (or not engaging) in particular forms of collaboration with local actors – local universities, talent agencies, competitors, and third-party service providers – follower MNCs contribute to the reproduction and differentiation of local business practices, not least by giving important signals to future investors.

Implications and Conclusion

As a result of the recent offshoring dynamic, new types of geographical S&E clusters appear to be emerging. Unlike typical industry clusters in Western economies, S&E clusters in emerging economies show distinct features that reflect their role in the global economy. Most importantly, they develop capabilities in providing particular S&E talent and services to foreign MNCs rather than local companies. Furthermore, they typically serve MNCs with particular sourcing demands (e.g., demand for IT or engineering services), rather than MNCs from particular industries. Finally, S&E clusters typically attract investment by MNCs from particular countries. This is not only because S&E clusters may serve as geographical near-shore locations for particular companies. This is also because over time S&E clusters develop local practices and institutions which are customized by pioneer investors, who attract followers of the same national origin with similar sourcing interests.

Based on this observation, it can be proposed that S&E clusters whose resources and services are to some extent both standardized and customized are most likely to succeed. This is because incoming MNCs on the one hand favour local conditions which they are familiar with, e.g. through experience in other locations. For example, they might be familiar with technical

universities programs, or with external service providers that offer a particular range of services, or with local administrations that support local investments in various ways. Familiarity may ease the use of these local institutions and business players as "externally addressable resources" (Teece et al., 1997). On the other hand, S&E clusters need to develop certain service capabilities that distinguish them from other clusters. For example, incoming MNCs might value the potential availability of certain customized university programs they would not find easily in other locations. Since more specific features are often not readily available, it can be crucial for emerging clusters to get MNCs involved in shaping local business practices and institutions. That is why MNCs are important agents in the development of S&E clusters. They shape local conditions in such a way that clusters can become compatible with global practices and demands, while developing specific, customized features which attract MNCs with particular sourcing interests and an affinity with certain business practices and institutional settings.

This has interesting implications for sustainable cluster development and cluster-oriented policies. Although in the current cluster debate, sustainability is often associated with the need to support local businesses rather than MNCs, this article suggests that a strong MNC orientation might not necessarily contradict sustainable cluster development. This is because, as cluster institutions and local companies get in contact with particular MNCs, they learn about MNC demands and develop service capabilities that help them serve both established and new MNCs effectively. Policy makers should therefore regard foreign MNCs as important promoters of cluster formation. In the longer term, however, policies should not be targeted solely at the needs of particular MNCs (e.g. pioneer investors). This, indeed, could drive clusters into a dependency situation and could endanger sustainable development. Rather, local institutions and service providers need to learn to replicate practices of serving MNCs. MNCs that follow pioneer

investors can play an important role in reproducing, rejecting and differentiating particular services and in preparing clusters for a wider range of MNC demands. Some offshore hotspots, such as Shanghai and Bangalore, now feature local institutions and service providers that have learned to offer a variety of services to a number of both established and new investors.

Further research is needed to better understand how S&E clusters develop such service capabilities and what role MNCs play in this process. Comparative case studies may be an appropriate means to further establish and differentiate knowledge about these clusters and their formation. For example, future research might address similarities and differences between different types of S&E clusters and the roles MNCs play in the formation process. Recent studies suggest that clusters specialize in providing particular types of services. Some clusters might specialize in engineering services, others in IT, software development or knowledge services. Each specialization is likely to be reflected by the supply of particular talent, specialized service providers and supporting institutions. How these service orientations come about, and what role cluster initiatives can play in bringing about S&E clusters with particular orientations needs to be researched more thoroughly. In doing so, longitudinal research designs and multiple, both qualitative and quantitative, research methodologies should be utilized.

References

Barley, S. R., & Tolbert, P. S. (1997). Institutionalization and structuration: Studying the links between action and institution. *Organization Studies*, *18*(1), 93-117.

Barnes, J., & Morris, M. (2004). The German connection: Shifting hegemony in the political economy of the South African automotive industry. *Industrial and Corporate Change*, *13*(5), 789-814.

Bresnahan, T., Gambardella, A., & Saxenian, A. (2001). 'Old economy' inputs for 'new economy' outcomes: Cluster formation in the new Silicon Valleys. *Industrial and Corporate Change*, *10*(4), 835-860.

Brewer, T. L. (1992). An issue–area approach to the analysis of MNE–government relations. *Journal of International Business Studies*, *23*(2), 295-309.

Dahan, N., Doh, J., & Guay, T. (2006). The role of multinational corporations in transnational institution building: A policy network perspective. *Human Relations*, *59*(11), 1571-1600.

Deloitte (2004). *It's 2008: Do you know where your talent is? Why acquisition and retention strategies don't work*. New York:: Deloitte Development LLC.

Development, U. N. C. o. T. a. (2005). *Prospects for foreign direct investment and the strategies of transnational corporations 2005-2008*. Geneva: UNCTAD.

DiMaggio, P. J. (1988). Interest and agency in institutional theory. In Zucker, L. G. (Ed.), *Institutional patterns and organizations* (pp. 3-22). Cambridge, MA: Ballinger.

Dorado, S. (2005). Institutional entrepreneurship, partaking, and convening. *Organization Studies*, *26*(3), 385-414.

Enright, M. (2000). Regional clusters and multinational enterprises: Independence, dependence or interdependence? *International Studies of Management and Organization*, *30*(2), 114-138.

Feldman, M., Francis, J., & Bercovitz, J. (2005). Creating a cluster while building a firm: Entrepreneurs and the formation of industrial clusters. *Regional Studies*, *39*(1), 129-141.

Gereffi, G. (2005). *The new offshoring of jobs and global development*. Geneva: International Institute for Labor Studies and International Labor Organization.

Giddens, A. (1984). *The constitution of society. outline of the theory of structuration*. Cambridge: Polity Press.

Henley, J. (2006). Outsourcing the provision of software and IT-enabled services to India. *International Studies of Management & Organization*, *36*(4), 111-131.

Hoskisson, R. E., Eden, L., Lau, C. M., & Wright, M. (2000). Strategy in emerging economies. *Academy of Management Journal*, *43*(3), 249-267.

Kilduff, M., Tsai, W., & Hanke, R. (2006). A paradigm too far? A dynamic stability reconsideration of the social network research program. *Academy of Management Review*, *31*(4), 1031-1048.

Kirzner, I. M. (1973). *Competition and entrepreneurship*. Chicago and London: University of Chicago Press.

Kostova, T., & Roth, K. (2002). Adoption of an organizational practice by subsidiaries of multinational corporations: institutional and relational effects. *Academy of Management Journal*, *45*(1), 215-233.

Lerch, F., Sydow, J., Huxham, C., & Hibbert, P. (2007). *Leadership in Clusters – A Comparison of Four Photonics Clusters*. Paper presented at the 2007 Cluster Conference of The Competitiveness Institute (TCI), Portland.

Lewin, A. Y., & Couto, V. (2007). *Next Generation Offshoring: The Globalization of Innovation*. Durham: Duke University CIBER/Booz Allen Hamilton Report.

Manning, S., Massini, S., & Lewin, A. Y. (2008). A dynamic perspective on next-generation offshoring: The global sourcing of science & engineering talent. *Academy of Management Perspectives, forthcoming*.

Manning, S., Sydow, J., & Windeler, A. (2007). *The Art of Active Embedding: How Automotive Suppliers Develop Engineering Capabilities in Emerging Economies*. Paper presented at the Academy of Management Annual Meeting, Philadelphia.

Murmann, J. P. (2003). *Knowledge and competitive advantage*: Cambridge University Press.

Oliver, C. (1991). Strategic responses to institutional processes. *Academy of Management Review*, *16*(1), 145-179.

Oliver, C., & Holzinger, I. (2008). The effectiveness of strategic political management: A dynamic capabilities framework. *Academy of Management Review*, *33*(2), 496-520.

Patibandla, M., & Petersen, B. (2002). Role of transnational corporations in the evolution of a high-tech industry: The case of India's software industry. *World Development*, *30*(9), 1561-1577.

Porter, M. (2000). Location, competition, and economic development: Local clusters in a global economy. *Economic Development Quarterly*, *14*(1), 15-34.

Saxenian, A. (1994). *Regional advantage. Culture and competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press.

Schumpeter, J. A. (1911). *Theory of economic development*. Cambridge, MA: Harvard University Press.

Sydow, J., Lerch, F., Huxham, C., & Hibbert, P. (2007). *Developing Photonics Clusters: Commonalities, Contrasts and Contradictions*. London: AIM Working Paper.

Sydow, J., & Windeler, A. (1998). Organizing and evaluating interfirm networks - a structurationist perspective on network process and effectiveness. *Organization Science*, *9*(3), 265-284.

Teece, D. J., Pisano, G., & Shuan, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509-533.

Whittington, R. (1992). Putting Giddens into action: Social systems and managerial agency. *Journal of Management Studies*, *29*(6), 693-712.

Wolfe, D. A., & Gertler, M. S. (2004). Clusters from the inside and out: Local dynamics and global linkages. *Urban Studies*, *41*(5/6), 1071-1093.

Figure 1: Impact of MNCs on the Formation of S&E Clusters